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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:
Kazuhito SUISHU, et al.
Serial No.: 10/784,356
Filed: February 23, 2004
For: DATA PROCESSING SYSTEM

Art Unit: 2186
Examiner: To Be Assigned
Confirmation No.: 2296

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to:

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

October 8, 2004
Date of Deposit

Kimberly Yee
Name

Kimberly Yee 10/08/04
Signature Date

PETITION TO MAKE SPECIAL UNDER MPEP § 708.2, VIII

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

I. **Petition:**

Applicants hereby petition to make this new application, which has not received any examination by the Examiner, Special.

II. **Claims:**

Check and complete all applicable items (a) through (c).

(a) x All the claims in this case are directed to a single invention.

(b) x If the Office determines that all the claims presented are not obviously directed to a single invention, Applicants will make an election without traverse as a prerequisite to the grant of special status.

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III. **Search:**

A. Check all applicable items (d) though (g)

A search has been made by:

(d) _ the inventor

(e) _ attorney

(f) x professional searcher (Search Report attached hereto)

(g) _ foreign Patent Office

in the following:

B. Complete all applicable items below

(h) x field of search:

Class	Subclasses
707	204
711	100, 112, 114, 162 and 165

(i) _ publications:

(j) _ foreign patents:

(k) _ search by corresponding foreign Patent Office or at the former International Patent Institute at The Hague, Netherlands

C. Copy of references

Copies of the references listed in the attached Form PTO-1449 are not provided herewith since the requirement has been waived for U.S. patent applications filed after June 30, 2003.

D. Detailed discussion of the references

There is submitted herewith a detailed discussion of the references which discussion particularly points out how the claimed subject matter is distinguishable over the references.

x Also attached is an Information Disclosure Statement.

E. Fee

The fee required by 37 CFR 1.17 (h) is to be paid by:

x The attached check in the amount of $130.00. If there are any additional fees due in connection with the filing of this Petition to Make Special, please also charge those fees to our Deposit Account No. 50-1314.

Respectfully submitted,
HOGAN & HARTSON L.L.P.

Date: October 8, 2004

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DETAILED DISCUSSION OF THE REFERENCES AND COMPARISON TO THE PRESENT INVENTION

IV. Field of the Invention:

The subject matter of the above-identified application relates to data replication among a plurality of storage systems and resuming data replication when a failure occurs in the storage systems.

V. Related Background Art:

Conventional technologies exist for the replication of information from a first storage system to a second storage system and a third storage system. According to one known technology, a first storage system stores data in the first storage system and transfers data stored in the first storage system to a second storage system, as well as to a third storage system. A computer and the first storage system are connected by a communications link. The first storage system and the second storage system are connected by another communications link and the first storage system and the third storage system are also connected by a communications link. The first storage system has a first logical volume that is the subject of replication. The second storage system has a second logical volume that is the subject of replication of the first logical volume. The third storage system has a third logical volume that is a replication of the first logical volume. The first storage system, when updating the first logical volume, performs a data replication processing on the second logical volume, and stores in management information a difference between the first logical volume data and the third logical volume data for every data size of a predetermined size. Subsequently, the first storage system uses the management information to perform a data replication processing on the third logical volume.

The conventional technology manages the differences in data between the first logical volume and the third logical volume for every data size of a predetermined size. The management information that manages such differences creates a problem of growing larger in proportion to the amount of data that is the subject of replication. Furthermore, due to the fact that the third logical volume is updated based on the management information and in an order unrelated to the order of the data update, data integrity cannot be maintained in the third logical volume. (*See, Application, Page 2, Line 1 – Page 3, Line 3*).

VI. The References:

A. The Duyanovich et al. Reference:

U.S. Patent No. 5,555,371 to Duyanovich et al. ("hereinafter "Duyanovich") discloses a system for data backup copying with delayed directory updating. Primary and secondary data processing systems are coupled via a communications system. A log structured array (LSA) system is used for data storage in both systems. As shown in Fig. 1, primary data processing system 1 generates data that is to be backed up for disaster recovery purposes and secondary data processing system 2 receives the data for disaster backup and recovery. Secondary data processing system 2 receives an update sequence from primary host 17 of the primary processing system 1. After receiving the update sequence, secondary host 38 of the secondary data processing system 2 sends commit commands to a secondary data storage 39 of the secondary data processing system 2. *(See, Figures 1-2, 11 and Column 8, Lines 40-60).*

B. The Crockett et al. Reference:

U.S. Patent No. 6,052,758 to Crockett et al. (hereinafter "Crockett") discloses a system for interface error detection and isolation in a direct access storage device

(DASD) system. According to Crockett, a remote copy system 2 includes a primary controller 4 having a non-volatile storage unit 6 and a cache 8 and a secondary controller 12 also having a non-volatile storage unit 14 and a cache 16. The remote copy system 2 further includes a data mover application 20 that reads modified data from the cache 8 in the primary controller 4 and transfers the data to the secondary controller 12 for transfer to a secondary DASD 18. The data mover 20 also time stamps data updates in a primary DASD 10 to insure that updates are done in the secondary DASD in the same order as they were done in the primary DASD 10. *(See, Figure 1; Column 2, Line 59 – Column 3, Line 10; and Column 4, Lines 27-30).*

C. **The Micka et al. Reference:**

U.S. Patent No. 6,148,383 to Micka et al. ("hereinafter "Micka") discloses a data storage system employing a universal timer to perform peer-to-peer asynchronous maintenance of consistent mirrored storage. According to Micka, the data storage system includes a primary host 102, a primary site 106 and a secondary site 108. If the primary site 106 experiences a failure of a storage component or communications therewith, the primary host 102 can supervise the secondary site 108 in resurrecting data back to the primary site 106. The primary site 106 includes primary storage units 112 and 118, primary controllers 110 and 116 and primary journals 111 and 117. Each primary controller 110, 116 receives updates and stores the updates in a storage order. Each primary controller 110, 116 also transmits the updates and corresponding sequence codes to secondary controllers 120 and 126 that are included in the secondary site 108. Each of the secondary controllers 120, 126 stores the receiving updates in the journals 122 and 128 of the secondary site 108. (See, Figures 1 and 4; Column 4, Lines 34-51; and Column 5, Lines 2-12).

D. The Kern et al. Reference:

U.S. Patent No. 6,463,501 to Kern et al. ("hereinafter "Kern") discloses a method, system and program for maintaining data consistency among updates across groups of storage areas using update times. A primary control unit 4 initially writes data updates to a sidefile 24 in a cache 10. A system data mover (SDM) 30 takes the data updates from the sidefile 24 and writes to a journal 26. The SDM 30 manages the transfer of updates to a secondary DASD 22. (See, Figures 1 and 2; Column 4, Lines 29-61; and Column 5, Lines 9-42).

E. The Ohno et al. Reference:

U.S. Patent Application Publication No. 2003/0229764 to Ohno et al. (hereinafter "Ohno") discloses a system and method for copying information from a first storage subsystem to a second storage subsystem. A first data storage subsystem 11a receives an updated data block from a host computer 61. The first data storage subsystem 11a transfers the updated data block to a second data storage subsystem 11b. A third subsystem 11c transfers the update information received from the first subsystem 11a to a fourth subsystem 11d with the use of remote-copy functions. (See Figures 1, 5, 7, and 8 and Paragraphs 40, 41, 53-54, 65, 67, 68, 69, 73, 76, and 88).

VII. The Present Invention is Patentably Distinguishable Over the Cited References

A. One Embodiment of the Present Invention:

The present invention seeks to address the above problems that exist with the conventional technologies for replicating information. According to an embodiment of the present invention, a data processing system includes a first

storage system, a second storage system and a third storage system. The first storage system sends and receives information from a host device. The second and third storage systems receive data from the first storage system. The first storage system stores data sent by the host device in a first storage area and stores data written in the first storage area and update information relating to the data written in the first storage area in a second storage area. The second storage system stores data sent from the first storage system in a third storage area and stores data written in the third storage area and update information relating to the data written in the third storage area in a fourth storage area. Also, the third storage system stores data read from the second storage area and update information relating to the data read from the second storage area in a fifth storage area and stores data that is generated based on the data written in the fifth storage area and update information relating to the data written in the fifth storage area in a sixth storage area.

Thus, according to an embodiment of the present invention, the data processing system performs data replication from the first storage system to the third storage system while maintaining data integrity in the third storage system and reducing the amount of management information used in data replication. Also, according to an embodiment of the present invention, the data processing system maintains the integrity in the third storage system even while data in the third storage system is updated to the latest data in the event the first storage system fails. (*See, Application, Page 3, Lines 6*-15).

B. Distinction Over the Cited References:

The cited references do not disclose the above features of the present invention. In particular, the cited references fail to disclose or suggest the features and arrangements of (1) "the first storage system [that] includes. . .a second storage

area that stores the data written in the first storage area and update information relating to the data written in the first storage area"; (2) "the second storage system [the] includes. . .a fourth storage area that stores the data written in the third storage area and update information relating to the data written in the third storage area"; and (3) "the third storage system [that] includes a fifth storage area that stores data read from the second storage area and update information relating to the data read from the second storage area, and a sixth storage area that stores data that is generated based on the data written in the fifth storage area and the update information relating to the data written in the fifth storage area" as recited in each of the independent claims of the present application, namely independent claims 1 and 16.

The backup data copying system of Duyanovich is provided to make a backup copy of data with delayed directory updating. Primary and secondary data processing systems are coupled via a communications system. An LSA system is used for data storage in both systems. As shown in Fig. 1, primary data processing system 1 generates data that is to be backed up for disaster recovery purposes and secondary data processing system 2 receives the data for disaster back up and recovery. Secondary data processing system 2 receives an update sequence from primary host 17 of the primary processing system 1. After receiving the update sequence, secondary host 38 of the secondary data processing system 2 sends commit commands to a secondary data storage 39 of the secondary data processing system 2. *(See, Figures 1-2, 11 and Column 8, Lines 40-60).* Accordingly, Duyanovich does not disclose or suggest "the first storage system [that] includes. . .a second storage area that stores the data written in the first storage area and update information relating to the data written in the first storage area" and "the second storage system [the] includes. . .a fourth storage area that stores the data written in the third storage area and update information relating to the data written in the

third storage area" as recited in independent claims 1 and 16. Moreover, Duyanovich also fails to disclose or suggest "the third storage system [that] includes a fifth storage area that stores data read from the second storage area and update information relating to the data read from the second storage area, and a sixth storage area that stores data that is generated based on the data written in the fifth storage area and the update information relating to the data written in the fifth storage area" as recited in the independent claims.

The system for interface error detection and isolation in a DASD system disclosed by Crockett includes a primary controller 4 having a non-volatile storage unit 6 and a cache 8 and a secondary controller 12 also having a non-volatile storage unit 14 and a cache 16. The system further includes a data mover application 20 that reads modified data from the cache 8 in the primary controller 4 and transfers the data to the secondary controller 12 for transfer to a secondary DASD 18. The data mover 20 also time stamps data updates in a primary DASD 10 to insure that updates are done in the secondary DASD in the same order as they were done in the primary DASD 10. *(See, Figure 1; Column 2, Line 59 – Column 3, Line 10; and Column 4, Lines 27-30).* Crockett also fails to disclose or suggest the third storage system. Moreover, Crockett also fails to disclose or suggest the first, second and third storage systems having storage areas for storing written data and update information relating to the written data.

The data storage system employing a universal timer to perform peer-to-peer asynchronous maintenance of consistent mirrored storage of Micka includes a primary host 102, a primary site 106 and a secondary site 108. If the primary site 106 experiences a failure of a storage component or communications therewith, the primary host 102 can supervise the secondary site 108 in resurrecting data back to the primary site 106. The primary site 106 includes primary storage units 112 and 118, primary controllers 110 and 116 and primary journals 111 and 117. Each

primary controller 110, 116 receives updates and stores the updates in a storage order. Each primary controller 110, 116 also transmits the updates and corresponding sequence codes to secondary controllers 120 and 126 that are included in the secondary site 108. Each of the secondary controllers 120, 126 stores the receiving updates in the journals 122 and 128 of the secondary site 108. (See, Figures 1 and 4; Column 4, Lines 34-51; and Column 5, Lines 2-12). Likewise, Micka fails to disclose or suggest the third storage system. Moreover, Micka also fails to disclose or suggest the first, second and third storage systems having storage areas for storing written data and update information relating to the written data.

Kern's method, system and program for maintaining data consistency among updates across groups of storage areas using update times includes a primary control unit 4 that initially writes data updates to a sidefile 24 in a cache 10. An SDM 30 takes the data updates from the sidefile 24 and writes to a journal 26. The SDM 30 manages the transfer of updates to a secondary DASD 22. (See, Figures 1 and 2; Column 4, Lines 29-61; and Column 5, Lines 9-42). Kern also fails to disclose or suggest a third storage system and the first, second and third storage systems having storage areas for storing written data and update information relating to the written data.

The system and method for copying information from a first storage subsystem to a second storage subsystem disclosed by Ohno includes a first data storage subsystem 11a that receives an updated data block from a host computer 61. The first data storage subsystem 11a transfers the updated data block to a second data storage subsystem 11b. A third subsystem 11c transfers the update information received from the first subsystem 11a to a fourth subsystem 11d with the use of remote-copy functions. (See Figures 1, 5, 7, and 8 and Paragraphs 40, 41, 53-54, 65, 67, 68, 69, 73, 76, and 88). Although Ohno discloses a third storage

system, Ohno fails to disclose or suggest the first, second and third storage systems having storage areas for storing written data and update information relating to the written data.

Since the cited references fail to disclose, teach or suggest the above feature recited in each of the independent claims, these references cannot be said to anticipate nor render obvious the invention which is the subject matter of these claims.

Accordingly, independent claims 1 and 16 are believed to be in condition for allowance and such allowance is respectfully requested. The remaining claims depend either directly or indirectly from independent claims 1 and 16 and recite additional features of the present invention which are neither disclosed nor fairly suggested by the cited references and are therefore also believed to be in condition for allowance.

VIII. Conclusion

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance and such action is respectfully requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the Los Angeles, California telephone number (213) 337-6809 to discuss the steps necessary for placing the application in condition for allowance.

If there are any fees in connection with the filing of this petition, please charge the fees to our Deposit Account No. 50-1314.